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(56) References cited:
WO-A-80/01331
DE-A- 2 109 760
DE-A- 2 444 375
DE-A- 2 845 540
FR-A- 901 549
US-A- 4 139 832
US-A- 4 599 596

Glossary of Chemical Terms, Hangel & Harvley, Publ. van Nostrand Reinhold Co., 1976

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Description

This invention relates to a chip-type fuse for interrupting overcurrents which damage electronic parts mounted on a printed circuit board (PCB), and more particularly, to an improved chip-type fuse which is inexpensive and can be easily automatically mounted on a PCB.

Generally, a fuse is used to interrupt overcurrents which damage electronic parts mounted on a PCB. For that purpose, chip-type fuses which are mounted on a PCB have been developed in recent years.

One of the conventional chip-type fuses includes an insulating substrate and a conductor. The insulating substrate has two electrodes disposed thereon, and the conductor electrically connects the two electrodes to each other. The conductor is made of thin-film metal and disposed in a recess formed on the lower surface of the substrate.

Another conventional chip-type fuse includes an insulating substrate having a pair of electrodes, a gold (Au) wire wire-bonded to the electrodes, and a resin which is disposed on the substrate to seal the gold wire.

The conventional fuses are very expensive because the recess for housing the conductor must be formed or the wire must be wire-bonded to the electrodes. In addition, the conventional fuses have so complicated shapes that they can not easily be automatically mounted on a PCB.

From WO 87/01331, a circuit fuse assembly, comprising a plurality of fuse elements, is known. The plurality of fuse elements is simultaneously formed using printed circuit or through hole plating techniques and includes means for easily substituting a different one of the fuse elements when the in-circuit fuse element burns out due to an overload current condition.

From FR-A-901549, a fuse circuit for high frequency applications is known, comprising a metal conductor disposed on a support element which is constituted of ceramic.

DE-A-2845540 discloses a heat resistant coating material for electrical resistors. The coating material is composed of a mixture of silicone resin and epoxy resin to provide an inflammable coating for electrical components.

It is the object of this invention to provide a chip-type fuse which can be produced at low cost.

It is another object of this invention to provide a chip-type fuse which can be easily automatically mounted on a PCB.

According to this invention, there is provided a chip-type fuse comprising the features of claim 1.

The above and other objects, advantages and features of this invention will be more fully understood when considered in conjunction with the following figures, of which:

Fig.1 is a sectional view of an embodiment of the invention;

and Fig.2 is a plan view of the embodiment of the invention.

Figs. 1 shows a chip-type fuse according to an embodiment of the invention.

A chip-type fuse 1 includes a ceramic substrate 2 as an insulating substrate which is rectangular like a rectangular chip-type resistor and whose size is 3.2mm x 1.6mm. Formed on an upper surface of ceramic substrate 2 is a conducting member 3 made of thin-film metal which is deposited or printed on upper surface 2a. Conducting member 3 can be made of a silver-palladium (Pd) alloy, silver-platinum (Pt) alloy, silver, copper, or gold. Electrodes 4a and 4b are formed on side ends 2b and 2c of substrate 2, respectively. Electrodes 4a and 4b are made of thin-film metal which is deposited on side ends 2b and 2c or disposed theron with other known methods. Conducting member 3 is a rectangular parallelepiped and both ends of the conducting member 3 are connected to electrodes 4a and 4b, respectively. Upper surface 2a of substrate 2 is coated with a silicone resin film (protecting film) 5 to completely cover conducting member 3.

Since chip-type fuse 1 has the same shape as micro-chip resistors, it can be easily automatically mounted on a PCB to reduce the mounting cost.

The operation of fuse 1 is described hereinafter.

If an overcurrent flows through fuse 1, conducting member 3 is melted and broken somewhere between the ends to interrupt the overcurrent. Since conducting member 3 is covered with silicone resin film 5, metal vapor generated at the melted portion are prevented from scattering outside fuse 1. Moreover, arc discharge caused by the metal vapor is prevented from continuing because the silicone resin functions as an arc-extinguishing medium, completely protecting the electronic parts. In addition, since conducting member 3 is formed directly on upper surface 2a of substrate 2, it has a high heat-radiating effect to allow flows of high-level currents despite the small size of fuse 1.

On the other hand, since conducting member 3 is not made of a golden wire unlike the conventional chip-type fuse, conducting member 3 is hardly broken, easy to handle, and highly heat-resistant.

Fig. 2 shows a plan view of the chip-type fuse according the invention.

Side ends 2b of the substrate 2 in the longitudinal direction respectively have semicircular holes 12c which extend through in height.

Conducting member 3 has trimmed portions 3b which are trimmed with laser light to obtain appropriate resistance.

The operation of chip-type fuse 1 is described hereinafter.

If an overcurrent flows through fuse 1, one of trimmed portions 3b is melted and broken to interrupt the overcurrent. The reliability of fuse 1 increases because trimmed portions 3b are easily melted and broken by an overcurrent.

Although the conducting member 3 is rectangular it can have another shape. Moreover, the protecting film 5 can be made of a glass material.

The above description and the accompanying drawings are merely illustrative of the application of the principles of the present invention and are not limiting. Numerous other arrangement which employ the principles of the invention and which fall within the scope may be readily devised by those skilled in the art. Accordingly, the invention is not limited by the foregoing description, but only limited by the scope of the appended claims.

Claims

1. A chip-type fuse (1) comprising:
   an insulating member (2);
   a pair of electrode members (4a, 4b) which are made of thin-film metal and disposed on the side ends (2b, 2c) of said insulating member (2);
   a conducting member (3), which is formed on the upper surface (2a) of said insulating member (2), electrically connecting said pair of electrode members (4a, 4b) to each other;
   the conducting member (3) includes a plurality of trimmed portions (3b); and
   a protecting member (5) disposed on said insulating member (2) for protecting said conducting member (3),
   characterized in that
   the plurality of trimmed portions (3b) of the conducting member (3) are connected in series.

2. The fuse according to claim 1, wherein the insulating member (2) is a rectangular ceramic parallelepiped.

3. The fuse according to claim 1, wherein the protecting member (5) is made of a silicone resin material.

4. The fuse according to claim 1, wherein the protecting member (5) is made of a glass material.

Patentansprüche

1. Chip-Sicherung (1) umfassend:
   ein isolierendes Teil (2);
   ein Paar von Elektroden (4a, 4b), welche aus einer Dünnfilm-Metallschicht bestehen und auf beiden Seitenenden (2b, 2c) des isolierenden Teils (2) angeordnet sind;
   ein Leiter (3), welcher auf der Oberfläche (2a) des isolierenden Teils (2) gebildet ist, und das genannte Paar von Elektroden (4a, 4b) miteinander verbindet;
   wobei der Leiter (3) eine Vielzahl von getrimmten Abschnitten (3b) aufweist; und
   ein Schutzteil (5), welches auf dem isolierenden Teil (2) angeordnet ist um den Leiter (3) zu schützen,
   dadurch **gekennzeichnet,** daß
   die Vielzahl von getrimmten Abschnitten (3b) des Leiters(3) in Serie miteinander verbunden sind.

2. Sicherung gemäß Anspruch 1, worin das isolierende Teil (2) ein rechteckiges, keramisches Parallelepiped ist.

3. Sicherung nach Anspruch 1, worin das Schutzteil (5) aus einem Siliconharzmaterial besteht.

4. Sicherung nach Anspruch 1, worin das Schutzteil (5) aus einem glasartigen Material besteht.

Revendications

1. Fusible du type puce (1) comprenant :
   un élément d'isolation (2);
   une paire d'éléments d'électrode (4a, 4b) qui sont réalisés en un métal en film mince et qui sont disposés sur les extrémités latérales (2b, 2c) dudit élément d'isolation (2);
   un élément de conduction (3) qui est formé sur la surface supérieure (2a) dudit élément d'isolation (2) et qui connecte électriquement ladite paire d'éléments d'électrode (4a, 4b) l'un à l'autre ;
   l'élément de conduction (3) inclut une pluralité de parties rognées (3b); et
   un élément de protection (5) disposé sur ledit élément d'isolation (2) pour protéger ledit élément de conduction (3),
   caractérisé en ce que
   la pluralité de parties rognées (3b) de l'élément de conduction (3) sont connectées en série.

2. Fusible selon la revendication 1, dans lequel l'élément isolant (2) est un parallélépipède rectangle en céramique.

3. Fusible selon la revendication 1, dans lequel l'élément de protection (5) est réalisé à partir d'un matériau de résine silicone.

4. Fusible selon la revendication 1, dans lequel l'élément de protection (5) est réalisé à partir d'un matériau de verre.

FIG. 1

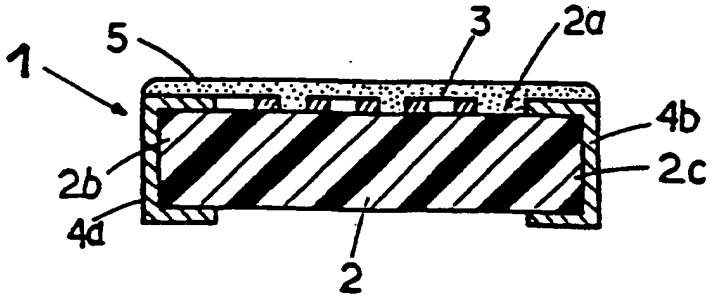

FIG. 2